

## The DOMAIN & RANGE of a QUADRATIC FUNCTION

Domain of a function: all values of  $x$  that exist for a function

Range of a function: all values of  $y$  that exist for a function

### Example 1: Reasoning about restricting the domain and range of a function.

A flare is shot vertically upward. A motion sensor records its height above the ground every 0.2 seconds. The results are shown in the table:

Time (s)	0.0	0.2	0.4	0.6	0.8	1.0	1.2	1.4	1.6	1.8	2.0
Height (m)	0.0	1.8	3.2	4.2	4.8	5.0	4.8	4.2	3.2	1.8	0.0

The function  $h(t) = -5t^2 + 10t$  models the height of the flare.

Domain:

Time  
 $\{x \in \mathbb{R} \mid 0 \leq x \leq 2\}$



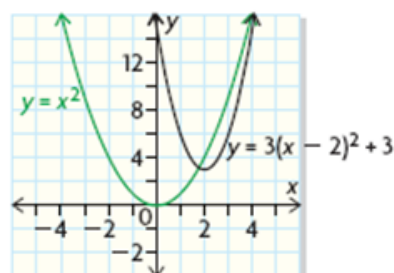
Range:

Height  
 $\{y \in \mathbb{R} \mid 0 \leq y \leq 5\}$

### Example 2: Connecting the domain and range of a function to its graph.

Find the domain and range of  $y = 3(x - 2)^2 + 3$ .

$D = \{x \in \mathbb{R} \mid x \in \mathbb{R}\}$   
 $R = \{y \in \mathbb{R} \mid y \geq 3\}$   
 $3 \leq y$



**Example 3: Connecting the domain and range to linear functions**

Find the domain and range of each linear function:

a)  $f(x) = -3x + 4$

$y = mx + b$

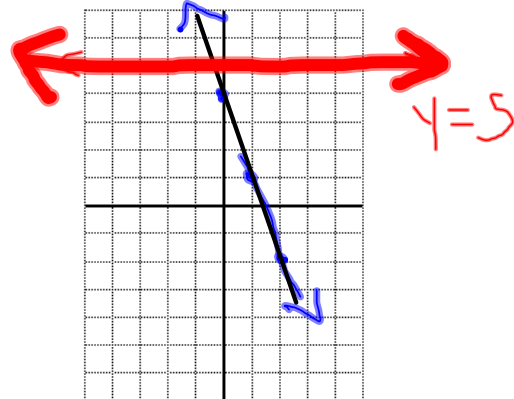
$m = -3$

$b = 4$

$m = \frac{-3}{1} = \frac{\text{rise}}{\text{run}}$

b)  $y = 5$   
 $\{x \in \mathbb{R} \mid x \in \mathbb{R}\}$   
 $\{y \in \mathbb{R} \mid y = 5\}$

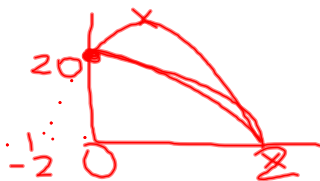
$D = \{x \in \mathbb{R} \mid x \in \mathbb{R}\}$   
 $R = \{y \in \mathbb{R} \mid y = 5\}$



**Example 4: Placing restrictions on the domain and range.**

A ball thrown from the top of a building falls to the ground below. The path of the ball is modelled by the function  $h(t) = -5t^2 + 20$ , where  $h(t)$  is the height of the ball above ground, in metres, and  $t$  is the elapsed time in seconds. What are the domain and range of this function?

$h(t) = -5t^2 + 20$



$h(0) = -5(0)^2 + 20$

$h(0) = 20$

need to find the zeros

$0 = -5t^2 + 20$

$\frac{5t^2}{5} = \frac{20}{5}$

$t^2 = 4$

$t = \pm\sqrt{4}$

$t = \cancel{2} \quad t = 2$

$V(0, 20)$



$D = \{x \in \mathbb{R} \mid 0 \leq x \leq 2\}$   
 $R = \{y \in \mathbb{R} \mid 0 \leq y \leq 20\}$

